US005749514A

United States Patent [19]

Brown et al.

[11] **Patent Number: 5,749,514**

[45] **Date of Patent: May 12, 1998**

[54] **HOLLOW STACKABLE PRODUCT WITH CURVED SIDESTRIPS IN LONGITUDINAL FOLDS OF CONICALLY CONTOURED SIDEWALLS**

[75] Inventors: **Paul Philip Brown**, Carlsbad, Calif.; **Jens Ole Sorensen**, Cayman Kai, Cayman Islands

[73] Assignee: **Universal Ventures**, Cayman Islands

[21] Appl. No.: **650,167**

[22] Filed: **May 20, 1996**

[51] **Int. Cl.**[6] **B65D 3/06**

[52] **U.S. Cl.** **229/400**; 229/45

[58] **Field of Search** 229/400, 45; 220/671

[56] **References Cited**

U.S. PATENT DOCUMENTS

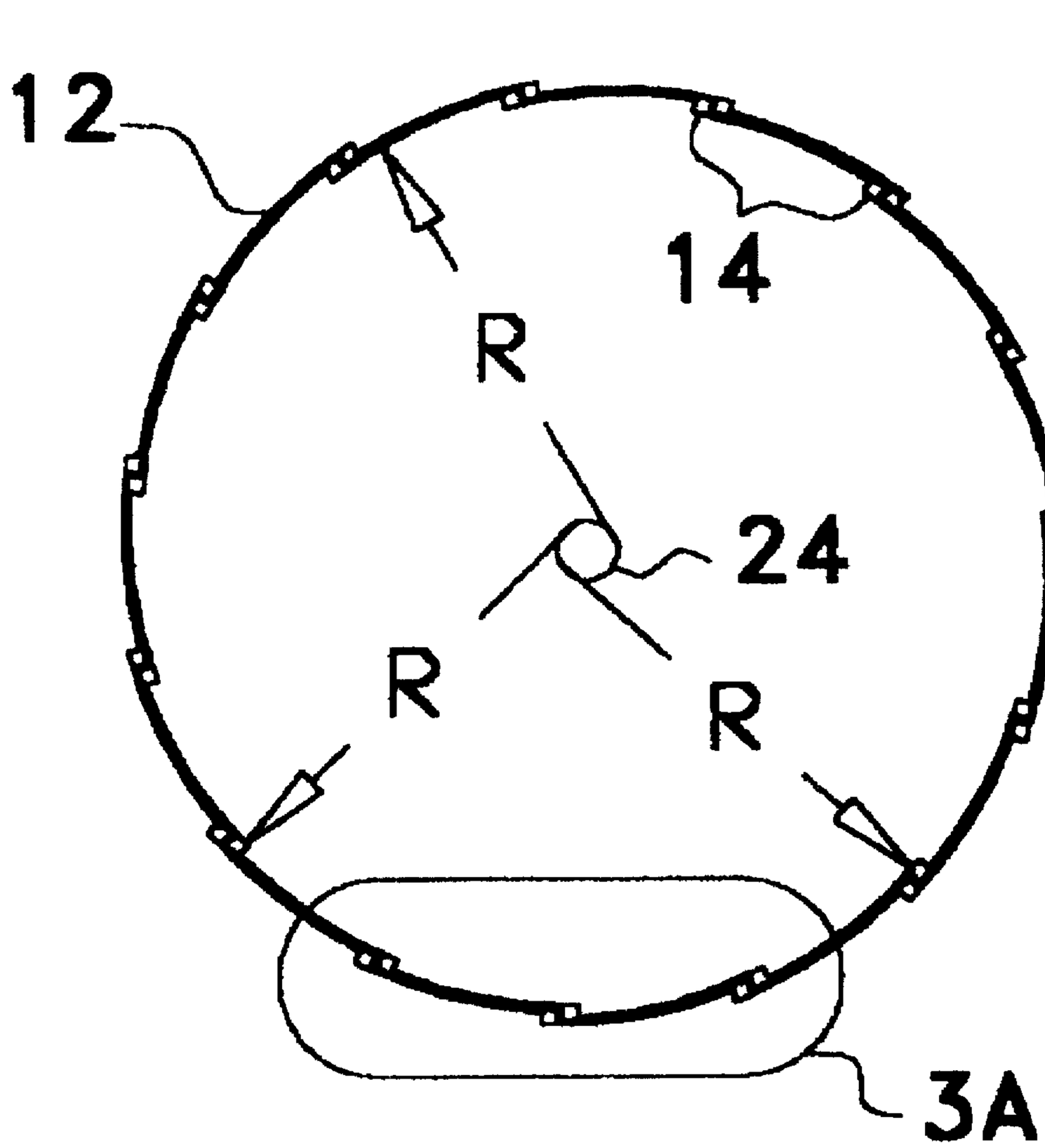
991,246	5/1911	Rosenfeld	229/400
1,310,698	7/1919	Hill	229/400
1,864,836	6/1932	Lacner	229/400
2,041,437	5/1936	Sidon	229/400
2,240,045	4/1941	Mackenzie	229/400
2,459,073	1/1949	Hamilton	229/400
4,284,226	8/1981	Herbst	229/400
5,267,685	12/1993	Sorensen .	

Primary Examiner—Christopher T. McDonald
Attorney, Agent, or Firm—Edward W. Callan

[57] **ABSTRACT**

A hollow stackable injection-molded product includes a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows. Each fold includes a first side strip laterally extending from the top of a first ridge to the bottom of a first furrow and a second side strip laterally extending from the bottom of the first furrow to the top of a second ridge next to the first ridge. Over most of the longitudinal extent of the sidewall, at least a predominant portion of each of the second side strips has an outward approximately conic-section lateral curvature to thereby provide a better fit between like products of such configuration when stacked inside one another and to thereby further reduce their stacking height. The lateral curvature of each second side strip is approximately circular. The lateral curvature of the individual second side strips is defined by a radius, with the length of the radius varying in accordance with only the longitudinal extent of the sidewall. The radii for the individual second side strips respectively extend from different points of origin on an approximately circular arc.

22 Claims, 1 Drawing Sheet



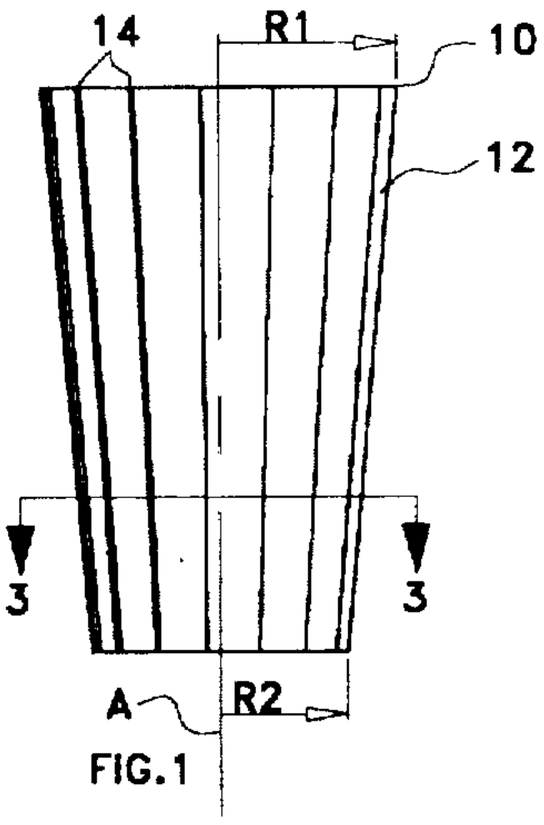


FIG.1

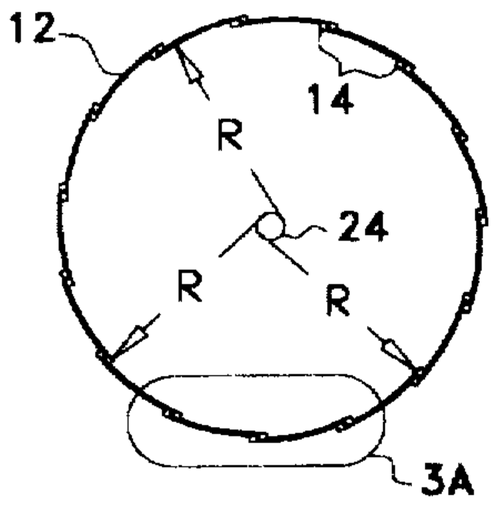


FIG.3

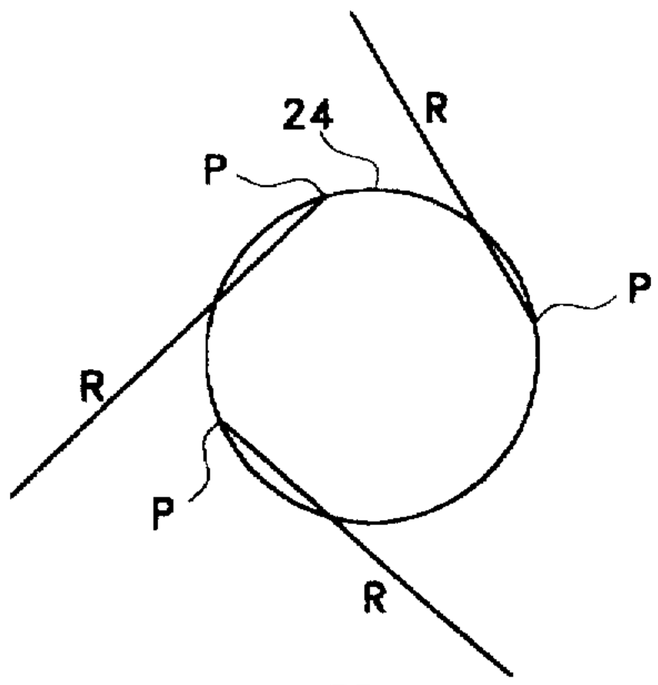


FIG.3B

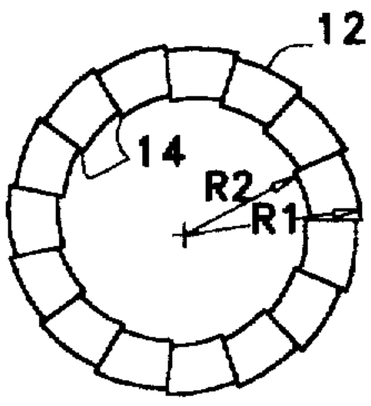


FIG.2

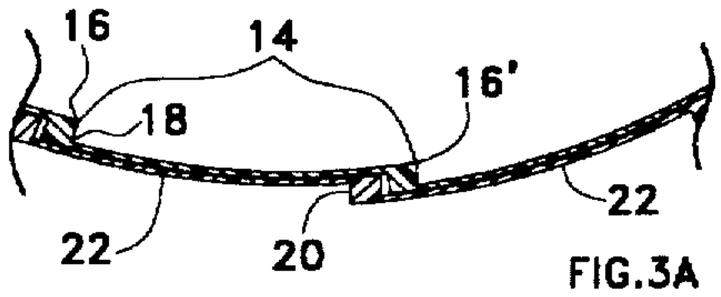


FIG.3A

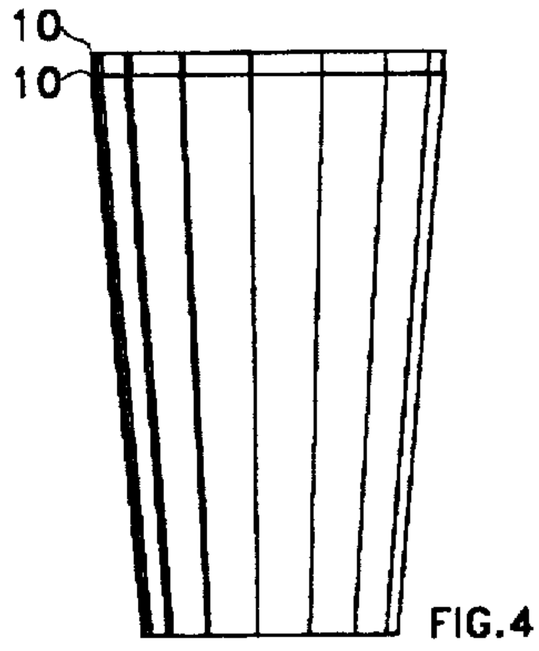


FIG.4

HOLLOW STACKABLE PRODUCT WITH CURVED SIDESTRIPS IN LONGITUDINAL FOLDS OF CONICALLY CONTOURED SIDEWALLS

BACKGROUND OF THE INVENTION

The present invention generally pertains to hollow stackable products and is particularly directed to an improvement in the stackability of hollow products of the type that include a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows. The longitudinal folds enhance the stiffness of such hollow stackable products.

A prior art product of this type is shown in U.S. Pat. No. 5,267,685 to Jens Ole Sorensen, one of the inventors of the present invention. The hollow stackable product described therein comprises at least a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows, each fold including a first side strip laterally extending from the top of a first said ridge to the bottom of a first said furrow; and a second side strip laterally extending from the bottom of the first said furrow to the top of a second said ridge next to the first said ridge, wherein the first side strip has a greater wall thickness than the second side strip. Products of such configuration can be stacked within one another without there being much space between the side strips of adjacent stacked products, whereby the stacking height of such products was reduced in relation to the stacking height of earlier prior art products of this type.

SUMMARY OF THE INVENTION

In one aspect, the present invention provides a hollow stackable injection-molded product comprising at least a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows, each fold including a first side strip laterally extending from the top of a first said ridge to the bottom of a first said furrow; and a second side strip laterally extending from the bottom of the first said furrow to the top of a second said ridge next to the first said ridge; wherein the first side strips have a greater wall thickness than the second side strips; and wherein over at least most of the longitudinal extent of the section of the sidewall, at least a predominant portion of each of a plurality of the second side strips has an outward lateral curvature. The present invention thereby provides a better fit between hollow stackable products of such configuration to thereby further reduce the stacking height.

In another aspect, the present invention provides a hollow stackable product comprising at least a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows, each fold including a first side strip laterally extending from the top of a first said ridge to the bottom of a first said furrow; and a second side strip laterally extending from the bottom of the first said furrow to the top of a second said ridge next to the first said ridge; wherein over at least most of the longitudinal extent of the section of the sidewall, at least a predominant portion of each of a plurality of the second side strips has an outward approximately circular lateral curvature.

The present invention further provides a stack of two like products according to the present invention.

Additional features of the present invention are described with reference to the detailed description of the preferred embodiment.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a side plan view of a preferred embodiment of a hollow stackable product according to the present invention.

FIG. **2** is a top plan view of the product shown in FIG. **1**.

FIG. **3** is an enlarged sectional view of the product shown in FIG. **1** taken along lines **3—3**.

FIG. **3A** is a further enlarged sectional view of the portion of the sidewall of the product of FIG. **1** shown in region **3A** of FIG. **3**.

FIG. **3B** is an enlargement of the center portion of FIG. **3** illustrating the manner in which three of the radii defining the curvature of the second side strips extend from different points on a circular arc.

FIG. **4** is side plan view of a stack of hollow stackable products as shown in FIG. **1**.

DETAILED DESCRIPTION

Referring to the Drawing, a preferred embodiment of a hollow stackable product **10** according to the present invention includes a section of a generally conically contoured sidewall **12** having a plurality of longitudinal folds **14** of alternating ridges **16** and furrows **18**. Each fold **14** includes a first side strip **20** laterally extending from the top of a first ridge **16** to the bottom of a first furrow **18** and a second side strip **22** laterally extending from the bottom of the first furrow **18** to the top of a second ridge **16'** next to the first ridge **16**, as best seen in FIG. **3A**. Over most of the longitudinal extent of the section of the sidewall **12**, at least the predominant portion of each of the second side strips **22** has an outward approximately conic-section lateral curvature. The first side strip **20** has a shorter lateral extent than the second side strip **22**. In alternative embodiments (not shown), the first side strip **20** does not have a shorter lateral extent than the second side strip **22**. The longitudinal folds **14** are not parallel to the longitudinal axis A of the product **10**; and the first side strips **20** need not be in a plane that contains the longitudinal axis A. The first side strips **20** do not have to be straight. For example, the first side strips **20** may tend to have a spiral shape.

Preferably, the first side strips **20** have a greater wall thickness than the second side strips **22**. The variation in wall thickness may reduce the required injection pressure and clamp force when the product is manufactured by an injection molding process.

In the preferred embodiment the lateral curvature of each second side strip **22** is approximately circular. The lateral curvature of the individual second side strips **22** is defined by a radius, with the length of the radius R varying in accordance with only the longitudinal extent of the sidewall **12**. At a given longitudinal position of the sidewall **12**, the radii R for the individual second side strips **22** respectively extend from different points of origin P on a circular arc **24**, as best seen in FIG. **3B**. In the preferred embodiment shown in the Drawing there are fifteen such points of origin P uniformly spaced at twenty-four degree intervals around the circular arc **24** to thereby define fifteen second side strips **22**. In the preferred embodiment the circular arc **24** from which the radii R respectively extend is of an approximately uniform dimension for most of the longitudinal extent of the sidewall **12**.

In the preferred embodiment, the ridges **16** and furrows **18** of the folds **14** have a sharp contour as best seen in FIG. **3A**. In alternative preferred embodiments (not shown), the ridges and furrows of the folds are rounded, such as shown in FIG.

5 of the aforementioned U.S. Pat. No. 5,267,685, or the folds include combinations of sharp and rounded ridges and furrows and/or ridges and/or furrows having other contours.

When one product **10** is disposed in a like product **10** such that each first side strip **20** of the one product is positioned closely adjacent a first side strip **20** of the other product and each second side strip **22** of the one product is positioned closely adjacent a second side strip **22** of the second product the product **10** has a shorter stacking height than the prior art products.

The advantages specifically stated herein do not necessarily apply to every conceivable embodiment of the present invention. Further, such stated advantages of the present invention are only examples and should not be construed as the only advantages of the present invention.

While the above description contains many specificities, these should not be construed as limitations on the scope of the present invention, but rather as exemplifications of the preferred embodiments described herein. Other variations are possible and the scope of the present invention should be determined not by the embodiments described herein but rather by the claims and their legal equivalents.

We claim:

1. A hollow stackable injection-molded product, comprising at least a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows, each fold including

a first side strip laterally extending from the top of a first said ridge to the bottom of a first said furrow; and

a second side strip laterally extending from the bottom of the first said furrow to the top of a second said ridge next to the first said ridge;

wherein the first side strips have a greater wall thickness than the second side strips; and

wherein over at least most of the longitudinal extent of the section of the sidewall, at least a predominant portion of each of a plurality of the second side strips has an outward lateral curvature.

2. A hollow stackable product, comprising at least a section of a generally conically contoured sidewall having a plurality of longitudinal folds of alternating ridges and furrows, each fold including

a first side strip laterally extending from the top of a first said ridge to the bottom of a first said furrow; and

a second side strip laterally extending from the bottom of the first said furrow to the top of a second said ridge next to the first said ridge;

wherein over at least most of the longitudinal extent of the section of the sidewall, at least a predominant portion of each of a plurality of the second side strips has an outward approximately circular lateral curvature.

3. A product according to claim **1**, wherein the first side strip has a shorter lateral extent than the second side strip.

4. A product according to claim **3**, wherein the lateral curvature of the individual second side strips is defined by a radius, with the length of the radius varying in accordance with only the longitudinal extent of the sidewall.

5. A product according to claim **4**, wherein at a given longitudinal position of the sidewall the radii for the individual second side strips respectively extend from different points on an approximately circular arc.

6. A product according to claim **5**, wherein the different points are uniformly spaced around the arc.

7. A product according to claim **5**, wherein the arc from which the radii respectively extend is of an approximately uniform dimension for a plurality of longitudinal positions.

8. A product according to claim **2**, wherein the lateral curvature of the individual second side strips is defined by a radius, with the length of the radius varying in accordance with only the longitudinal extent of the sidewall.

9. A product according to claim **8**, wherein at a given longitudinal position of the sidewall the radii for the individual second side strips respectively extend from different points on an approximately circular arc.

10. A product according to claim **9**, wherein the different points are uniformly spaced around the arc.

11. A product according to claim **9**, wherein the arc from which the radii respectively extend is of an approximately uniform dimension for a plurality of longitudinal positions.

12. A stack of at least two like products according to claim **1**.

13. A stack of at least two like products according to claim **2**.

14. A stack of products according to claim **12**, wherein the first side strip has a shorter lateral extent than the second side strip.

15. A stack of products according to claim **14**, wherein the curvature of the individual second side strips is defined by a radius, with the length of the radius varying in accordance with only the longitudinal extent of the sidewall.

16. A stack of products according to claim **15**, wherein at a given longitudinal position of the sidewall the radii for the individual second side strips respectively extend from different points on an approximately circular arc.

17. A stack of products according to claim **16**, wherein the different points are uniformly spaced around the arcs.

18. A stack of products according to claim **16**, wherein the arc from which the radii respectively extend is of an approximately uniform dimension for a plurality of longitudinal positions.

19. A stack of products according to claim **13** wherein the curvature of the individual second side strips is defined by a radius, with the length of the radius varying in accordance with only the longitudinal extent of the sidewall.

20. A stack of products according to claim **19**, wherein at a given longitudinal position of the sidewall the radii for the individual second side strips respectively extend from different points on an approximately circular arc.

21. A stack of products according to claim **20**, wherein the different points are uniformly spaced around the arc.

22. A stack of products according to claim **20**, wherein the arc from which the radii respectively extend is of an approximately uniform dimension for a plurality of longitudinal positions.

* * * * *